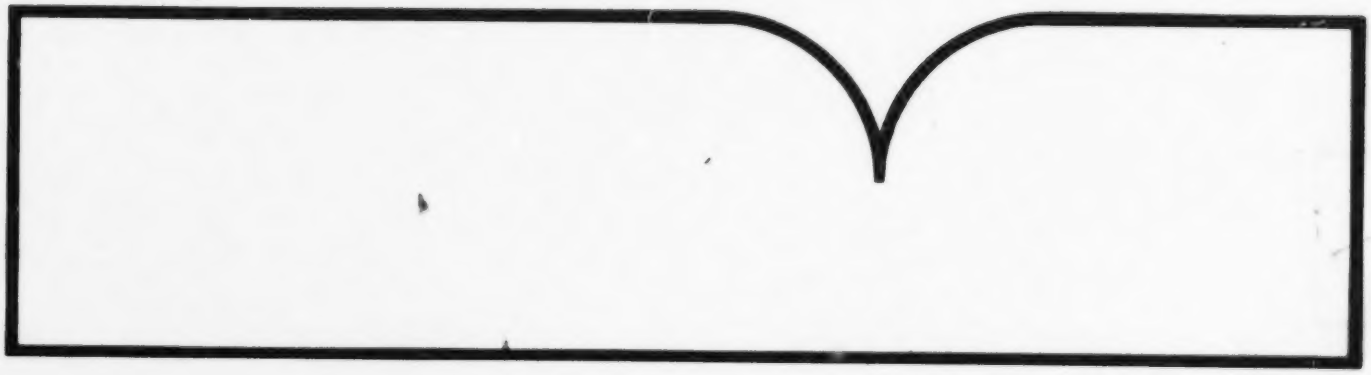
PB80-199383

# The Effect of Load and Inertia on Particulate Emissions

(U.S.) Environmental Protection Agency
Ann Arbor, MI

Jan 80



U.S. Department of Commerce
National Technical Information Service
NTIS

EPA-AA-SDSB-80-1

PB80-199383

Technical Report

January, 1980

# The Effect of Load and Inertia on Particulate Emissions

by

Eugene Danielson

NOTICE

Technical Reports do not necessarily represent final EPA decisions or positions. They are intended to present technical analysis of issues using data which are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments which may form the basis for a final EPA decision, position, or regulatory action.

Standards Development and Support Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
Office of Air, Noise and Radiation
U.S. Environmental Protection Agency

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

## Introduction

This report summarizes particulate emissions data from light-duty diesel trucks operating over a range of road loads and inertia weights. The results indicate that diesel particulate emissions are relatively insensitive to road load but are significantly influenced by changes in vehicle inertia weight. Information of this nature is useful in determining differences in particulate emissions that can be expected when the same engine is applied to vehicles of different sizes and weights.

## Discussion

Data from four sources are presented in this report. They are General Motors' and Mercedes Benz' responses to the Light-Duty Diesel Particulate Notice of Proposed Rulemaking, Ricardo Consulting Engineers, and the EPA Motor Vehicle Emissions Laboratory. The EPA tests were run on a small diesel Dodge truck over a range of load and inertia conditions indicated in Figures 1 and 2, and Table 1. Data from the other sources were collected in a similar fashion and while there are differences in levels and slopes of the results the trends among sources are consistent.

**TECHNICAL REPORT DATA**
*(Please read Instructions on the reverse before completing)*

| | |
|---|---|
| 1. REPORT NO. EPA-AA-SDSB-80-1 | 2. |
| 3. RECIPIENT'S ACCESSION NO. PB 80 199383 | |
| 4. TITLE AND SUBTITLE The Effect of Load and Inertia on Particulate Emissions | 5. REPORT DATE January 1980 |
| | 6. PERFORMING ORGANIZATION CODE |
| 7. AUTHOR(S) Eugene Danielson | 8. PERFORMING ORGANIZATION REPORT NO. |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Environmental Protection Agency Office of Mobile Source Air Pollution Control Standards Development and Support Branch Ann Arbor, Michigan 48105 | 10. PROGRAM ELEMENT NO. |
| | 11. CONTRACT/GRANT NO. |
| 12. SPONSORING AGENCY NAME AND ADDRESS same as box 9 | 13. TYPE OF REPORT AND PERIOD COVERED Technical |
| | 14. SPONSORING AGENCY CODE |

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report summarizes particulate emissions data from light-duty diesel trucks operating over a range of road loads and inertia weights. The results indicate that diesel particulate emissions are relatively insensitive to road load but are significantly influenced by changes in vehicle inertia weight. Information of this nature is useful in determining differences in particulate emissions that can be expected when the same engine is applied to vehicles of different sizes and weights.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
|---|---|---|
| Trucks<br>Diesel engines<br>Emission<br>Particles<br>Exhaust emissions | Light-duty trucks<br>Particulates<br>Particulate emissions<br>Road loads<br>Inertia weights | |

| | | |
|---|---|---|
| 18. DISTRIBUTION STATEMENT Release unlimited | 19. SECURITY CLASS *(This Report)* Unclassified | 21. NO. OF PAGES |
| | 20. SECURITY CLASS *(This page)* Unclassified | 22. PRICE |

EPA Form 2220-1 (9-73)

Table 1

Summary of Particulate Emissions for Various Loads and Inertias (Continued)

| Vehicle | Source | IW | HP | Particulate Emissions g/mi |
|---|---|---|---|---|
| Mercedes 300D | Mercedes Submission to LDD Particulate Hearings | 3000 | 7.4 | 0.47 |
| | | 3000 | 9.2 | 0.46 |
| | | 3000 | 12.8 | 0.47 |
| | | 3000 | 16.4 | 0.48 |
| | | 4000 | 7.4 | 0.47 |
| | | 4000 | 9.2 | 0.48 |
| | | 4000 | 11.0 | 0.48 |
| | | 4000 | 14.6 | 0.49 |
| | | 4000 | 16.4 | 0.49 |
| | | 2500 | 12.8 | 0.45 |
| | | 3500 | 12.8 | 0.46 |
| | | 3750 | 12.8 | 0.43 |
| | | 4000 | 12.8 | 0.48 |
| | | 4500 | 12.8 | 0.50 |
| Opel 2100D | Ricardo data | 2000 | 8.3 | 0.54 |
| | | 2000 | 16.6 | 0.57 |
| | | 3000 | 10.3 | 0.57 |
| | | 3000 | 20.6 | 0.62 |
| | | 4000 | 12.0 | 0.62 |
| | | 4000 | 24.0 | 0.72 |

Table 1

Summary of Particulate Emissions for Various Loads and Inertias

| Vehicle | Source | IW | HP | Particulate Emissions g/mi |
|---|---|---|---|---|
| Dodge Truck | EPA MVEL Lab | 4500 | 14 | 0.50 |
| | | 5500 | 14 | 0.61 |
| | | 4500 | 20 | 0.50 |
| | | 5500 | 20 | 0.60 |
| GM Vehicle #78504 | GM Submission to LDD Particulate Hearings | 3500 | 14 | 0.65 |
| | | 4500 | 14 | 0.71 |
| | | 5500 | 14 | 0.81 |
| GM Vehicle #89589 | GM Submission to LDD Particulate Hearings | 3500 | 14 | 0.30 |
| | | 4500 | 14 | 0.35 |
| | | 5500 | 14 | 0.46 |
| Oldsmobile 350D installed in LD Truck | GM Submission to LDD Particulate Hearings | 5000 | 20 | 0.58 |
| | | 5500 | 20 | 0.76 |

Figure 1

Particulate Emissions as a Function of Inertia Weight
FTP Driving Cycle